

An explanatory model regarding the relationships between psychological traits and creativity

María Luisa Sanz de Acedo Lizarraga^{1*}, María T. Sanz de Acedo Baquedano¹ y Antonio H. Closas²

¹ Public University of Navarra
² University of Northeastern Argentina

Título: Un modelo explicativo de las relaciones entre variables de la persona y creatividad.

Resumen: El objetivo de esta investigación fue probar un modelo teórico explicativo de las relaciones que puedan darse entre determinadas variables psicológicas y la creatividad. Concretamente, se examinaron las relaciones existentes entre inteligencia, personalidad, motivación intrínseca, autoeficacia creativa y creatividad ideacional. El estudio se llevó a cabo con una muestra formada por 180 universitarios (136 mujeres y 44 hombres), los cuales fueron evaluados en las variables objeto de estudio en dos sesiones fuera del horario académico regular. Los resultados obtenidos, analizados por medio de la técnica de ecuaciones estructurales, confirmaron el modelo y mostraron que tanto las variables independientes (inteligencia y personalidad) como las intermediarias (motivación intrínseca y autoeficacia creativa) que configuran el modelo propuesto influyeron en el fenómeno de la creatividad, siendo la autoeficacia creativa la variable personal que más intervino significativamente en la creatividad ideacional.

Palabras clave: Inteligencia; personalidad; motivación intrínseca; autoeficacia creativa; creatividad.

An explanatory model regarding the relationships between psychological traits and creativity.

Abstract: This research tested a theoretical model of the relationships between certain psychological variables and creativity. Specifically, the relationships among intelligence, personality, intrinsic motivation, creative self-efficacy, and ideational creativity were examined. This study was conducted with a sample of 180 college students (136 women and 44 men) who were evaluated with regard to the variables above in two sessions outside the regular academic schedule. The results obtained via structural equation analysis supported the model and revealed that the independent variables (intelligence and personality) and the intermediate variables (intrinsic motivation and creative self-efficacy) that comprise the proposed model influenced creativity. Furthermore, creative self-efficacy was the most significant trait associated with ideational creativity.

Key words: Intelligence; personality; intrinsic motivation; creative self-efficacy; creativity.

Introduction

Creativity is usually defined as the ability to generate many different ideas or produce objects that are original and valuable (Cheng, 2011; George & Zhou, 2001; Sternberg & Lubart, 1999). Creativity is a complex and multidimensional construct that involves psychological traits as well as characteristics of the process and the environment; however, little is known regarding the correlations between creativity and these variables. Hence, developing a model that explains, either partially or entirely, the relationships that exist between these variables and specific measures of ideational creativity is important. The present study examined the influence of specific psychological traits that, according to Kaufman (2009), might affect the creative process and its output: intelligence, personality, intrinsic motivation, and creative self-efficacy.

Research on the possible relationship between intelligence ("g" factor; GF) and creativity has attempted to determine the extent to which this factor influences creativity or whether a person can be creative in the absence of a high intellectual capacity (Elisondo & Donolo, 2010). To do so, most studies have been based on the "threshold theory". This theory holds that having a moderate level of intelligence is essential to be creative and that correlations between intelligence and creativity are stronger when intelligence quotients (IQs) are less than 120 but weaker when

they are above this threshold (Barron, 1969; Guilford & Christensen, 1973; Torrance, 1962). Overall, the research that has discussed this issue propose that uncertain associations exist between these variables, with a range between $r = .20$ and $r = .40$ assuming that the variance of average creativity ranges between 5% and 20% (Silvia, 2008). However, this nonlinear relationship between intelligence and creativity has been questioned because the correlations between these variables depend on the type of measurement used, the creativity domain explored, and other factors (Kim, 2005; Runco & Albert, 1986). Similarly, Sligh, Connors, and Roskos-Ewoldsen (2005) found that high IQs were more highly correlated with creativity than average IQs; thus, Nusbaum and Silvia (2011) concluded that divergent thinking is more convergent than the modern theories of creativity contend. According to Batey and Furnham (2006), intelligent individuals tend to be creative, and creative individuals tend to be intelligent.

Explaining the relationship between intelligence and creativity remains difficult due in part to two points. First, multidimensional studies (Vincent, Decker, & Mumford, 2002) and meta-analyses of both variables (Carroll, 1993) suggest that features other than intellectual capacity contribute to the variance in creativity. In fact, people who take creativity tests must possess an open mind to generate many ideas, a strong motivation to develop them, and trust in their inventive potential in addition to certain cognitive skills (DeYoung, Quilty, & Peterson, 2007; Jaussi, Randel, & Dionne, 2007). Second, several authors claim that intelligence is also associated with non-cognitive variables. Specifically, they argue that: a) IQ tests measure not only intellectual skills but also the desire to display them (Duckworth, Quinn,

* Dirección para correspondencia [Correspondence address]: María Luisa Sanz de Acedo Lizarraga. Departamento de Psicología y Pedagogía. Universidad Pública de Navarra. Campus de Arrosadía s/n. 31006 Pamplona (España). E-Mail: mlsa@unavarra.es

Lynam, Loeber, & Stouthamer-Loeber, 2011); b) affective-motivational factors can influence the implementation of an intelligence test (Bowles, Gintis, & Osborne, 2001); and c) participants with high IQs have high self-efficacy scores (Jurcska, Lee, Chang, & Sequeira, 2011; Kumar & Lal, 2006). As a result, the relationships among these variables were incorporated into the model that this research tests.

The personality traits associated with creativity have been widely studied (Barron & Harrington, 1981; Batey & Furnham, 2008; Furnham, Crump, Batey, & Chamorro-Premuzic, 2009; George & Zhou, 2001). The Big Five Factors (which the current research employs) have provided a useful model for this type of study (Costa & McCrae, 1992; Goldberg, 1992; Hofstee, de Raad, & Goldberg, 1992). This theory argues that personality is composed of extroversion, agreeableness, conscientiousness, neuroticism, and openness. Of the five factors, the closest to creativity are openness with its two subcomponents (openness to culture, which is associated with an interest in staying informed and acquiring knowledge, and openness to experience, which is associated with fantasy, interpreting things from different points of view, aesthetics, positive feelings, and curiosity) and extroversion with its two subcomponents: dynamism, which is the ability to express one's self verbally, and dominance, which is the ability to excel and influence others (DeYoung et al., 2007; Dollinger, 2007; Wolfradt & Pretz, 2001; Zhiyan & Singer, 1996).

When a person is open to new experiences, their creativity test scores are significantly correlated with specific creative achievements (King, McKee-Walker, & Broyles, 1996; Perrine & Brodersen 2005); when a person is extroverted, their creativity test scores are significantly correlated with idea generation (Martindale & Dailey, 1996; Wuthrich & Bates, 2001). This finding indicates that openness is closer to the creative expression of a particular domain, and extroversion is more related to creative flow. According to Batey and Furnham (2006), the latter interpretation is explained by the fact that creativity tests are given to groups. Thus, extroverts are encouraged to improve their task performance because they consider them to be an opportunity to overcome risk and achieve a significant goal. In addition, the attempts to develop a profile of the most important creative personality traits have not been successful because certain features are more important to specific manifestations of creativity than others (Feist, 1998; Furnham, Batey, Booth, Patel, & Lozinskaya, 2011).

People may possess traits and capabilities that favour creativity (López Martínez & Navarro Lozano, 2010). As stated by Prabhu, Sutton, and Sauser (2008), however, achieving creativity depends on whether people are intrinsically motivated and interested in solving the issue or problem they face. Intrinsic motivation refers to the desire to perform an activity based on the satisfaction it generates and the autonomy it provides via cognitive, emotional, and social functioning. This variable is related to the choice of task, the value ascribed to it, the effort required, and the self-reliance

on one's own competence (Ryan & Deci, 2006). Initially, Amabile and her colleagues (Amabile, 1996; Amabile, Hill, Hennessey, & Tighe, 1994; Tierney, Farmer, & Graen, 1999) considered the role of motivation in creativity by arguing that intrinsic motivation is the best way to achieve a creative product; however, obvious situations exist in which external awards also favour creative performance (Eisenberg & Thompson, 2011; Eisenberger & Shanock, 2003). People with high intrinsic motivation usually want to learn new things, experience positive feelings, achieve relevant objectives, overcome difficulties as soon as possible, and enjoy their activities with special interest (Prabhu et al., 2008).

Self-efficacy, the belief or feeling that one can achieve success (Bandura, 1997), confidence in one's ability to generate creative ideas, is another variable this research considers. Several authors have emphasised the role that this construct plays with regard to creativity. Tierney and Farmer (2002, 2004) found that creative self-efficacy accurately predicted creativity (i.e., explained 35% of the variance) in a sample of 191 employees. Furthermore, this construct was negatively correlated ($r = -.11$) with job skills: as participant experience increased, creative efficacy decreased. Choi (2004) showed that self-efficacy is involved in creativity (i.e., it accounted for 24% of the variance of creative responses), and Jaussi et al. (2007) observed that creative self-efficacy predicted creativity and explained 14% of its variance. Like many others, these three authors argued that creative self-efficacy is an important trait with regard to creativity, although their studies had some limitations (Gruys, Munshi, & Dewett, 2011; Kaufman, 2009; Prabhu et al., 2008; Randel & Jaussi, 2003).

In summary, sufficient theoretical and empirical evidence suggest that intelligence and personality influence motivation and creative self-efficacy; moreover, these traits determine creativity. Despite their importance, however, few studies have been conducted concerning the role of these variables taken as a group with regard to creativity; this paper addresses this issue. Thus, we planned to test the explanatory model shown in Figure 1 that was developed using Bentler and Weeks (1980)' notation, which is at the heart of the Structural Equation Modelling Software (EQS) used for data processing and analysis. In this figure, E represents the error terms of the observed variables, and D represents the non-independent errors of the latent variables (i.e., intrinsic motivation, creative self-efficacy, and ideational creativity).

Purpose of the study

The primary purpose of this study was to analyse the following effects within the hypothesised model: a) the direct effects of intelligence and personality on creativity; b) the effects of intelligence and personality on intrinsic motivation and creative self-efficacy; c) the effects of intrinsic motivation and self-efficacy on creativity; and d) the combined effects of the independent variables (intelligence and personality) and the intermediate variables (intrinsic motivation and

creative self-efficacy) on creativity. We expected to find that these variables positively and significantly predicted ideational creativity.

Method

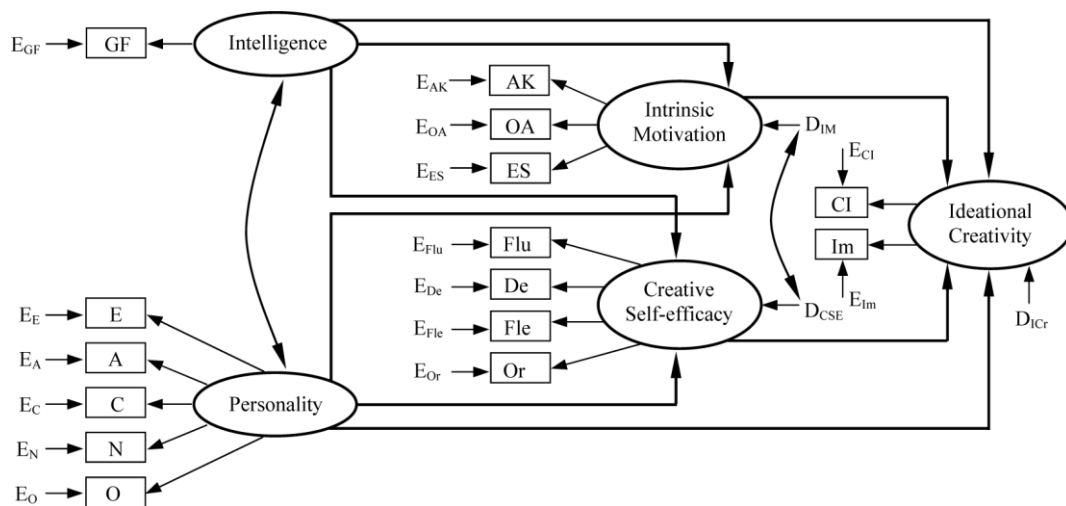
Participants

The sample consisted of 180 college students (136 women, 44 men) with a mean age of 21.11 years and a standard deviation of 4.81 years. Of these 180 students, 71 were enrolled in specialising in infant and primary education, 30 in social work, 27 in business administration and management, 17 in applied sociology, five in telecommunications engineering, six in industrial engineering, four in agricultural engineering, and 20 in economics. Students volunteer for this

study outside of their regular classes. The data were complete.

Procedure

After being informed about the research objectives and the desirability of truthful answers, students completed six assessment instruments across two 1.5-hour sessions with a few minutes of rest between tests. In the first session, students completed the instruments that measured intelligence, creativity, and intrinsic motivation; in the second session, creative self-efficacy, imagination, and personality were assessed. Researchers provided the instruments to groups of approximately 20 participants. These students were assured of their confidentiality regarding the treatment of their data and were offered a chance to view the results of their individual tests.



Note. Observed variables: GF = "g" Factor, E = Extroversion, A = Agreeableness, C = Conscientiousness, N = Neuroticism, O = Openness, AK = Acquiring knowledge, OA = Obtaining achievements, ES = Experiencing sensations, Flu = Fluency, De = Details, Fle = Flexibility, Or = Originality, IM = Intrinsic motivation, CI = Creative intelligence, Im = Imagination, CSE = Creative self-efficacy, and ICr = Ideational Creativity.

Figure 1. Theoretical model of relationships among intelligence, personality, intrinsic motivation, creative self-efficacy, and ideational creativity.

Instruments

Intelligence. Intelligence was assessed using Cattell's Culture Fair Intelligence Test, Scale-3 (Cattell & Cattell, 1973), which measures the fluid intelligence of people 15 years old and older using visual tasks that require the ability to form series, classifications, matrices, and topologies. This test was selected because it has been used in other studies that link intelligence and creativity (Preckel, Holling, & Wiese, 2006). In the current research, the reliability of the test (Cronbach's alpha coefficient) was $\alpha = .79$.

Personality. Personality was assessed using the 132-item Five Factor Personality Questionnaire (Caprara, Barbaranelli, & Borgogni, 1993), which measures five personality traits: extroversion (E), agreeableness (A), conscientiousness (C), neuroticism (N), and openness (O). Each of these traits is defined by two subdimensions that place the individual along a continuum of low, medium, and high intensity. The items employ questions concerning typical life behaviours, and answers are provided using a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, and 5 = strongly agree). The overall reliability of the questionnaire in the current sample (Cronbach's alpha coefficient) was $\alpha = .77$.

Intrinsic motivation.- Intrinsic motivation was assessed using the Intrinsic Motivation Scale based on the studies conducted by Ryan and Deci (Deci, Eghrari, Patrick, & Leone, 1994; Ryan & Deci, 2000, 2006; Ryan, Koestner, & Deci, 1991). The researchers prepared the scale *ad hoc*. This assessment consists of 12 Likert-type items with response intervals that range from 1 (not at all) to 5 (very much), of them: a) four items measure the intrinsic motivation to acquire knowledge (AK), e.g., *I feel satisfaction when I learn things*; b) four items, the desire for obtaining achievement (OA), e.g., *I feel satisfaction when I overcome difficulties in my studies*; and c) four items, the tendency to experience sensations (ES), e.g., *I feel satisfaction when I read topics that are interesting to me*. Scores between 1 and 19 points were considered typical of people with low intrinsic motivation with regard to the execution of a task; scores between 20 and 39 points were considered typical of people with medium intrinsic motivation; and scores between 40 and 60 points were considered typical of people with high intrinsic motivation. The reliability coefficient Cronbach's alpha for each of the subscales were .74, .73, and .76, respectively, and the reliability coefficient for the total scale was .75.

Creative self-efficacy.- Creative self-efficacy was evaluated using the Creative Self-Efficacy Scale designed by the researchers after reviewing the relevant literature on self-efficacy (Bandura, 1997; Schwarzer, Bähler, Kwiatak, Schröder, & Zhand, 1997) and creativity (Tierney & Farmer, 2002; Choi, 2004; Jaussi et al., 2007). This scale consists of eight items: a) two items measure belief in fluency (Flu), e.g., *When I encounter a problem, I usually try to look for various solutions*; b) two items measure belief in the development of details (De), e.g., *I like to communicate my ideas to others with many details*; c) two items measure belief in flexibility (Fle), e.g., *I think of different types of ideas when I consider a problem*; and d) two items measure belief in the ability to be original (Or), e.g., *I consider myself an imaginative person*. Scores between 1 and 13 points were considered typical of people with little current confidence in their ability to produce something new; scores between 14 and 26 points were considered typical of people with medium confidence in their creative abilities; and scores between 27 and 40 were considered typical of people with high confidence in their creative abilities. The total scores of the scale reached a reliability coefficient Cronbach's alpha of .75 and subscale scores of .67, .81, .79, and .80, respectively.

Ideational creativity.- Ideational creativity was assessed using the Creative Intelligence Test (CREA) designed by Corbalán Berná et al. (2003) and a Creative Task (CT) that demands imagination for successful completion. The CREA measures cognitive creativity through the generation of

questions (for 4 minutes) on a graphic sheet. It provides an overall score in percentiles and is strongly correlated with other creativity tests (e.g., Guilford's Battery). This test was used because it is standardised for Spanish samples, and it measures creative flow (to which this study refers). Its reliability coefficient was $\alpha = .74$. The CT consists of two questions: a) *What would happen if there were no monetary system in the globalised world in which we live?* and b) *What would happen if there were no rules of behaviour in today's society?* Participants were given 4 minutes to provide as many answers to each question as possible (fluency). Their answers were quantified, and an average score was calculated per person as an additional measure of ideational imagination. The CT had an internal consistency of $\alpha = .71$. To examine whether the CREA and CT measured similar aspects of creativity, their correlations were calculated, revealing a high degree of correlation ($r = .90$).

Data Analyses

The most significant analyses examined whether the relationships of the proposed model (Figure 1) were consistent with the empirical data; in this regard, the EQS analysis and the "robust" maximum likelihood methods were used because normality was not assumed with regard to the observed variables given that the normalised estimation of Mardia's coefficient (an indicator of multivariate kurtosis) was 15.34, which is higher than the criterion of 5 recommended by Bentler (2006). The model was evaluated using two methods: an analytical study determined and compared the relationships among the postulated variables, and the model's overall goodness of fit was analysed to determine the extent to which it reproduced the relationships of the empirical data in the correlation matrix. The correlation and Cronbach's alpha coefficients for each scale factor and the total scale were also determined.

Results

Descriptive analyses

Table 1 shows the means, standard deviations, and correlations between all the variables that comprise the model. The following should be noted: a) the high means for intrinsic motivation ($M = 49.12$) and creative self-efficacy ($M = 28.92$), according to the standard interpretation of both scales, demonstrated that students participated in the study because they found it interesting and had confidence in their ability to successfully complete it; and b) the high standard deviation for personality ($SD = 28.81$) indicates strong individual differences among study participants.

Table 1. Correlation matrix between the variables that comprised the model (N = 180)

	<i>M</i>	<i>SD</i>	Personality	Intrinsic motivation	Creative self-efficacy	Ideational creativity
Intelligence	26.04	4.31	.09	.16*	.17*	.29**
Personality	396.11	28.81	1	.17*	.38**	.19**
Intrinsic motivation	49.12	10.53		1	.11	.16*
Creative self-efficacy	28.92	4.27			1	.40**
Ideational creativity	19.29	5.63				1

* $p < .05$ ** $p < .01$

In principle, correlations allow researchers to confirm (or negate) the presumed relationships between different variables. As expected, approximately all model variables were positively and significantly correlated with each other (see Table 1). Some variables had midrange values (e.g., personality and creative self-efficacy, $r = .38$, $p < .01$ and personality and ideational creativity, $r = .40$, $p < .01$), whereas others had low values (e.g., intelligence and intrinsic motivation, $r = .16$, $p < .05$). The correlations between intelligence and personality as well as between intrinsic motivation and creative self-efficacy were not significant; moreover, these results were confirmed in the model analysis. Therefore, these correlations suggest that the study variables share certain features and partially support the structure of the model.

Structural Model

To evaluate the different relationships proposed in the model, specific factor weights of 1 were arbitrarily set between the observed and latent variables [GF and intelligence, extroversion (E) and personality, acquiring knowledge (AK) and intrinsic motivation, fluidity (Flu) and creative self-efficacy, creative intelligence (CI) and ideational creativity (ICr)]; the same method was applied to the regression coefficients, for the observed, intermediate, and dependent variables, with respect to the error terms (E_{GF} , E_E , E_A , E_C , E_N , E_O , E_{AK} , E_{OA} , E_{ES} , E_{Flu} , E_{De} , E_{Flc} , E_{Or} , E_{CI} , E_{Im} , D_{IM} , D_{CSE} , and D_{ICr}). The variances of the independent latent variables (intelligence and personality) and the variances of the errors of the estimated variables and factors were removed from the assessment except E_{GF} , which was set to zero because intelligence is only explained by that variable. The covariances between the independent latent variables and the covariances between errors (D_{IM} and D_{CSE}) for the intermediate latent variables (i.e., intrinsic motivation and creative self-efficacy) were also calculated, whereas the covariances not depicted in Figure 1 were considered null.

The analytical study of the relationship between the variables postulated in the model revealed that both the factor weights and the estimated structural parameters were significant. In fact, according to the measurement model, the factor weights that ranged from .42 to 1.00 were significant ($p < .05$) in all cases. Thus, these saturations are evidence for the construct validity of the latent variables in the model.

In addition, the eight regression coefficients in the structural model (.23*, .21*, and so on) that link the independent and dependent factors (intermediate and explained) were positive and significant, ranging from .16* to .48*. This find-

ing indicates that the model provides an acceptable overall fit. The values resulting from the estimates performed in the analysis can be observed in Figure 2.

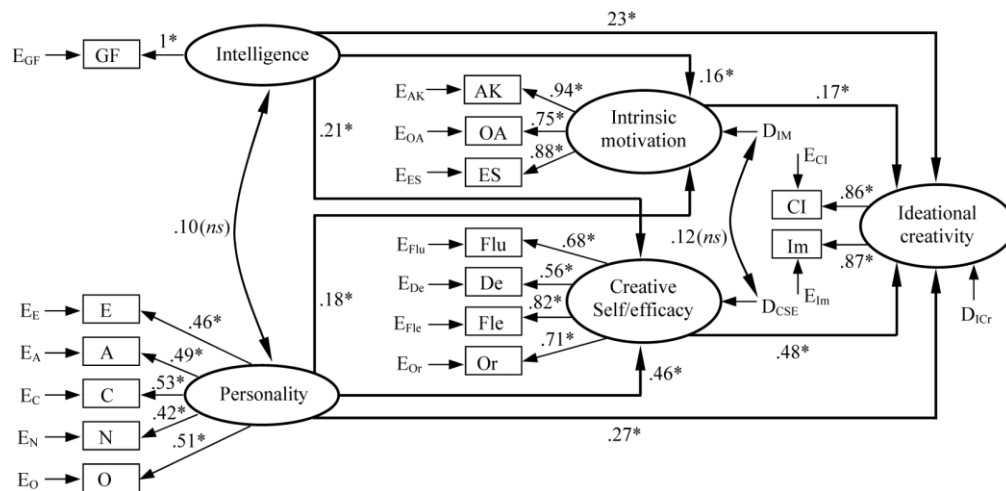
The covariance coefficients between intelligence and personality (.10 *ns*) as well as between D_{IM} and D_{CSE} were not significant (.12 *ns*). This non-significance suggests that the link between intelligence and personality is not unusual; therefore, these variables are associated with the shared antecedents that were previously considered in the model.

To determine the overall fit of the model, certain issues were taken into account. First, the residual covariance matrix (i.e., the difference between the covariance matrix of the sample and that of the estimated population) was considered. If the values of each element were small (i.e., close to zero), then the model should fit the data. Importantly, however, the average error of the off-diagonal standardised residuals was significantly low (.063), which indicates a correct adjustment.

Second, we found that most residuals (80%) were symmetrically distributed between -0.1 and 0.1 and centred on 0, which met their criterion. Therefore, the model has a reasonably good fit.

Before addressing the more classical indices that are taken into account to assess global goodness of fit, the convergence of the estimation process is another criterion that should be considered. Given that the estimation model is an iterative process, the fact that the algorithm converged quickly indicates a good fit. In the current study, only 18 iterations were needed for convergence; moreover, the observed changes were minimal after the thirteenth iteration.

Based on Schermelleh-Engel, Moosbrugger, and Müller (2003) the following indices were used for the overall model evaluation: the χ^2 statistic with the ratio (χ^2/df), where df represents the degrees of freedom, and the comparative fit index (CFI), the non-normed fit index (NNFI), and the root mean square error of approximation (RMSEA), which are not as dependent on sample size. The results of the first index were not significant at $\alpha = .05$: $\chi^2(78) = 85.92$, $p = .25$, and $\chi^2/df = 1.10$ (which is close to 1.00). The CFI and NNFI were .97 and .95, respectively, whereas the RMSEA was .02. These results indicate a possible match between the model and the data. The indices provided by the EQS program were also calculated including the incremental fit index (IFI = .97) and McDonald's fit index (MFI = .98). These values confirm that the model has goodness of fit because they exceeded the recommended criterion of .90.



Note. Observed variables: GF = “g” factor, E = Extroversion, A = Agreeableness, C = Conscientiousness, N = Neuroticism, O = Openness, AK = Acquiring knowledge, OA = Obtaining achievements, ES = Experiencing sensations, Flu = Fluency, De = Details, Fle = Flexibility, Or = Originality, CI = Creative intelligence, Im = Imagination, IM = Intrinsic motivation, CSE = Creative self-efficacy, ICr = ideational creativity, ns = Non-significant effect, and * $p < .05$.

Figure 2. Standardised results of the hypothesised model of relationships among intelligence, personality, intrinsic motivation, creative self-efficacy, and creativity.

In brief, we verified that the observed and predicted covariance matrix of the proposed model did not significantly differ from each other (i.e., the assumed model fits the empirical model and therefore might be useful to explain the data) given the various criteria and indicators used above and the fact that the model explains 61.06% of the total variance of the sample. Obviously, the model was immediately adopted to explain the study phenomenon. In addition, the adequacy of the general representation that characterises this model is shown in Figure 2.

Discussion

The analysed structural equation model proposes that the four latent variables studied (intelligence, personality, intrinsic motivation, and creative self-efficacy) influence the dependent variable (ideational creativity) separately and collectively. The results confirm this global hypothesis, which allows us to state that the proposed model fits the structure of the study data.

In light of the suggested model, both independent factors (intelligence and personality) and both mediating variables (intrinsic motivation and creative self-efficacy) were empirically related to ideational creativity. Previous studies have reported these results on an individual basis but not as a whole. This study found that intelligence, both directly and indirectly, significantly explains the variance of intrinsic motivation, creative self-efficacy, and creativity; in fact, its contribution to the latter variable was the highest (Batey & Furnham, 2006; Kim, 2005; Silvia, 2008). As Nusbaum and

Silvia (2011) argued, intelligence might act more effectively with regard to participants' last responses for each question in the Creative Task because their first responses might have been answered using automatic and rote strategies. For example, when asked *What would happen if there were no monetary system in the globalised world in which we live?* the initial responses of one person were, “It would be chaos”, and “Banks would shut down”; whereas the later responses were, “A subjective market would be created”, and “We would have to develop better negotiating skills”. When asked, *What would happen if there were no rules of behaviour in today's society?* the initial responses of others were, “Everyone would do whatever they wanted”, and “There would be more conflict”; whereas the later responses were, “People would not behave with moral integrity”, and “This situation would require highly educated citizens who would end up making their own rules”. The progress of creative ideation demonstrates that ideas of greater quality were more likely to occur after the first answers. The two measures of creativity attempt to capture the fluidity dimension and the cognitive basis of creation (Corbalán Berná et al., 2003; Corbalán Berná & Limiñana Gras, 2010).

Personality (i.e., the individual's way of being and acting as well as the appreciation of the differences between these constructs) affected participant desire to accomplish goals for their own benefit (i.e., intrinsic motivation), the ability to achieve personal goals, the feeling that they can produce something new (i.e., creative self-efficacy), and (particularly) the actual generation of original ideas. Therefore, this study found that personality traits partially explain the variance of creativity (Furnham et al., 2011; King et al., 1996; Martindale

& Dailey, 1996; Wuthrich & Bates, 2001). In the context of the model, the independent factors clearly had the greatest effect on the criterion variable due to the number of direct or indirect cause-and-effect relationships.

The results regarding intrinsic motivation were consistent with the proposed theory (Amabile, 1996; Amabile et al., 1994; Tierney et al., 1999); however, although their effect on ideational creativity was significant, it was also small. In addition, the influence of creative self-efficacy on ideation was a key factor. Other authors have also found this result (Guys et al., 2011; Jaussi et al., 2007; Kaufman, 2009; Tierney & Farmer, 2002, 2004). According to the creativity instruments employed, the trust that a person places in his or her abilities with regard to solving a problem, drawing conclusions from a difficult argument, or imagining new situations affects his or her performance of the activity that requires creativity. With regard to direct results, creativity was more affected by creative self-efficacy than intrinsic motivation. This finding also matches those of previous studies, which suggests that creative self-efficacy plays a significant mediation role in creative performance (Choi, 2004).

Although the results supported the theoretical model tested overall (i.e., the effects postulated for the different variables were observed), we must consider specific study limitations. First, the relationship between the variables used in this study should be interpreted with caution because other psychological traits might explain ideational creativity in college students, e.g., selective attention (Martínez Zaragoza, 2010), working and long-term memory (Butler, Scherer, & Reiter-Palmon, 2003), and prior knowledge of the subject (Kim, 2005). These variables should be incorporated into an additional explanatory model of creativity. Second, the study participants were students from a specific college, which does not allow us to draw inferences about other college students or other populations because participants were not randomly selected. Third, the fact that three instruments used in the study were developed *ad hoc* might limit the interpretation of these self-reports; note, however, that their psychometric values were acceptable. Finally, the model did not account for demographic variables such as participant age or gender. Furthermore, women predominated the sam-

ple, which might have significantly influenced the theoretical model.

Conclusions

Despite the aforementioned limitations, our results support the proposed explanatory model of ideational creativity with regard to the sample used. As noted above, this result should be considered with caution because it has not been achieved in other investigations. The results of this study suggest four lines of future action: the first three are of a theoretical nature, whereas the latter is of a practical one.

The theoretical considerations are as follows: a) it would be helpful to investigate our model using a longitudinal design with regular annual assessments of college students. This design would provide information concerning the possible changes that occur within the relationship between the independent variables and creativity. Another interesting extension of this study would be to replicate its results after organising the participants into groups to analyse the variable effects on group creativity; b) it would be advisable to continue examining new models using other variables involved in creativity, the context of creativity, and the creative process. Furthermore, researchers should continue testing more complex models that integrate both the individual-level variables analysed in this study as well as those related to the context and process of creativity; and c) finally, although the instruments of intrinsic motivation, creative self-efficacy, and imagination developed for this study proved to be relatively reliable and valid, reconfirming their psychometric properties with other samples would be advisable.

At the practical level, it would be interesting to raise the awareness of the university community with regard to the importance of the motivational and self-referential factors in ideational creativity. Second, it would be interesting to implement academic programs that explain creativity, promote it among students, and generate practical activities. These implemented initiatives will encourage creative networking among academics as well as the social and business worlds to improve our understanding of how to stimulate the creative process.

References

- Amabile, T. M. (1996). *Creativity in context: Update to the social psychology of creativity*. Boulder, CO: Westview Press.
- Amabile, T. M., Hill, K. G., Hennessey, B. A., & Tighe, E. M. (1994). The Work Preference Inventory: Assessing intrinsic and extrinsic motivational orientations. *Journal of Personality and Social Psychology*, 66(5), 950-967. DOI: 10.1037/0022-3514.66.5.950
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Barron, F. (1969). *Creative person and creative process*. New York: Holt, Rinehart & Winston.
- Barron, F., & Harrington, D. M. (1981). Creativity, intelligence, and personality. *Annual Review of Psychology*, 32, 439-476. DOI: 10.1146/annurev.ps.32.020181.002255
- Batey, M., & Furnham, A. (2006). Creativity, intelligence, and personality: A critical review of the scattered literature. *Genetic, Social, and General Psychology Monographs*, 123(4), 355-429.
- Batey, M., & Furnham, A. (2008). The relationship between measures of creativity and schizotypy. *Personality and Individual Differences*, 45(8), 816-821.
- Bentler, P. M. (2006). *EQS Structural equations program manual*. Encino, CA: Multivariate Software.
- Bentler, P. M., & Weeks, D. G. (1980). Linear structural equations with latent variables. *Psychometrika*, 45(3), 289-308. DOI: 10.1007/S11336-0119217-5
- Bowles, S., Gintis, H., & Osborne, M. (2001). The determinants of earnings: A behavioural approach. *Journal of Economic Literature*, 39(4), 1137-1176.

- Butler, A. B., Scherer, L. L., & Reiter-Palmon, R. (2003). Effects of solution elicitation aid and need for cognition on the generation of solutions to ill-structured problems. *Creativity Research Journal*, 15(2), 235-244.
- Caprara, G. V., Barbaranelli, C., & Borgogni, L. (1993). *BFQ Cuestionario «Big Five»*. Florencia, Italia: Organizzazioni Speciali, OS. [Adaptado por TEA Ediciones en 1995, Madrid].
- Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor analytic studies*. Cambridge: Cambridge University Press.
- Cattell, R. B., & Cattell, A. K. S. (1973). *Measuring intelligence with The Culture Fair Tests*. Illinois, USA: PAT. [Adaptado por TEA Ediciones en 2001, Madrid].
- Cheng, V. M. Y. (2011). Infusing creativity into eastern classrooms: Evaluations from student perspectives. *Thinking Skills and Creativity*, 6(1), 67-87. DOI: 10.1016/j.tsc.2010.05.001. ISSN: 1871-1871
- Choi, J. N. (2004). Individual and contextual predictors of creative performance: The mediating role of psychological processes. *Creativity Research Journal*, 16(2-3), 187-199. DOI: 10.1080/10400419.2004.9651452
- Corbalán Berná, J., & Limiñana Gras R. M. (2010). El genio en una botella. El test CREA, las preguntas y la creatividad. Introducción al monográfico "El test CREA, inteligencia creativa". *Anales de Psicología*, 26(2), 197-205.
- Corbalán Berná, F. J., Martínez Zaragoza, F., Donolo, D. S., Alonso Monreal, C., Tejerina Arreal, M., & Limiñana Gras, R. M. (2003). *CREA, Inteligencia Creativa. Una medida cognitiva de la creatividad. Manual [CREA, Creative Intelligence. A cognitive measure of creativity. Manual]*. Madrid: TEA Ediciones.
- Costa, P. T. Jr., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality and Individual Differences*, 13(6), 653-665. DOI: 10.1016/0191-8869(92)90236-I
- DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big-Five. *Journal of Personality and Social Psychology*, 93, 880-896.
- Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality*, 62(1), 119-142.
- Dollinger, S. J. (2007). Creativity and conservatism. *Personality and Individual Differences*, 43(5), 1025-1035. DOI:10.1016/j.paid.2007.02.023
- Duckworth, A. L., Quinn, P. D., Lynam, D., Loeber, R., & Stouthamer-Loeber M. (2011). Role of test motivation in intelligence testing. *Proceedings of the National Academy of Sciences (PNAS)*, 108(19), 7716-7720.
- Eisenberg, J., & Thompson, W. F. (2011). The effects of competition on improvisers' motivation, stress, and creative performance. *Creativity Research Journal*, 23(2), 129-136. DOI: 10.1080/10400419.2011.571185
- Eisenberger, R., & Shanock, L. (2003). Rewards, intrinsic motivation, and creativity: A case study of conceptual and methodological isolation. *Creativity Research Journal*, 15(2-3), 121-130.
- Elisondo, R. C., & Donolo, D. S. (2010). ¿Creatividad o inteligencia? *Anales de Psicología*, 26(2), 220-225.
- Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review*, 2(4), 290-309. DOI: 10.1207/s15327957pspr0204_5
- Furnham, A., Batey, M., Booth, T. W., Patel, V., & Lozinskaya, D. (2011). Individual difference predictors of creativity in Art and Science students. *Thinking Skills and Creativity*, 6(2), 114-121. DOI: 10.1016/j.tsc.2011.01.006. ISSN: 1871-1871
- Furnham, A. F., Crump, J., Batey, M., & Chamorro-Premuzic, T. (2009). Personality and ability predictors of the consequences test of divergent thinking in a large non-student sample. *Personality and Individual Differences*, 46(4), 536-540. DOI: 10.1016/j.paid.2008.12.007
- George, J. M., & Zhou, J. (2001). When openness to experience and conscientiousness are related to creative behaviour: An interactional approach. *Journal of Applied Psychology*, 86(3), 513-524. DOI:10.1037/0021-9010.86.3.513
- Goldberg, L. R. (1992). The development of markers for the Big Five factor structure. *Psychological Assessment*, 4(1), 26-42. DOI: 10.1037/1040-3590.4.1.26
- Gruys, M. L., Munshi, N. V., & Dewett, T. C. (2011). When antecedents diverge: Exploring novelty and value as dimensions of creativity. *Thinking Skills and Creativity*, 6(2), 132-137. DOI: 10.1016/j.tsc.2011.01.005
- Guilford, J. P., & Christensen, P. R. (1973). The one-way relation between creative potential and IQ. *Journal of Creative Behavior*, 7(4), 247-252. DOI: 10.1002/j.2162-6057.1973.tb01096.x
- Hofstee, W. K. B., de Raad, B., & Goldberg, L. R. (1992). Integration of the big five and circumplex approaches to trait structure. *Journal of Personality and Social Psychology*, 63(1), 146-163. DOI: 10.1037/0022-3514.63.1.146
- Jaussi, K. S., Randel, A. E., & Dionne, S. D. (2007). I am, I think I can, and I do: The role of personal identity, self-efficacy, and cross-application of experiences in creativity at work. *Creativity Research Journal*, 19(2-3), 247-258.
- Jurecska, D. E. S., Lee, C. E., Chang, K. B. T., & Sequeira, E. (2011). I am smart, therefore I can: Examining the relationship between IQ and self-efficacy across cultures. *International Journal of Adolescent Medicine and Health*, 23(3), 209-216.
- Kaufman, J. C. (2009). *Creativity 101*. New York, NY: Springer Publishing Company.
- Kim, K. H. (2005). Can only intelligent people be creative? *Journal of Secondary Gifted Education*, 16(1), 57-66. DOI: 10.1080/1040019.2012.677318
- King, L., McKee-Walker, L., & Broyles, S. (1996). Creativity and the five factor model. *Journal of Research in Personality*, 30(2), 189-203.
- Kumar, R., & Lal, R. (2006). The role of self-efficacy and gender differences among the adolescents. *Journal of the Indian Academy of Applied Psychology*, 32(3), 249-254.
- López Martínez, O., & Navarro Lozano J. (2010). Rasgos de personalidad y desarrollo de la creatividad. *Anales de Psicología*, 26(1), 151-158.
- Martindale, C., & Dailey, A. (1996). Creativity. Primary process cognition and personality. *Personality and Individual Differences*, 20(6), 409-414.
- Martínez Zaragoza, F. (2010). Impulsividad, amplitud atencional y rendimiento creativo. Un estudio empírico con estudiantes universitarios. *Anales de Psicología*, 26(2), 238-245. DOI: 10.6018/109121
- Nusbaum, E. C., & Silvia, P. J. (2011). Are intelligence and creativity really so different? Fluid intelligence, executive processes, and strategy use in divergent thinking. *Intelligence*, 39(1), 36-45. DOI: 10.1016/j.intell.2010.11.002
- Perrine, N. E., & Brodersen, M. R. (2005). Artistic and scientific creative behaviour: Openness and mediating role of interests. *Journal of Creative Research*, 39(4), 217-236.
- Prabhu, V., Sutton, C., & Sauser, W. (2008). Creativity and certain personality traits: Understanding the mediating effect of intrinsic motivation. *Creativity Research Journal*, 20(1), 53-66. DOI: 10.1080/10400410701841955
- Preckel, F., Holling, H., & Wiese, M. (2006). Relationship of intelligence and creativity in gifted and non-gifted students: An investigation of threshold theory. *Personality and Individual Differences* 40(1), 159-170. DOI: 10.1016/j.paid.2005.06.022
- Randel, A. E., & Jaussi, K. S. (2003). Functional background identity, diversity, and individual performance in cross-functional teams. *Academy of Management Journal*, 46(6), 763-774. DOI: 10.2307/30040667
- Runco, M. A., & Albert, R. S. (1986). The threshold theory regarding creativity and intelligence: An empirical test with gifted and nongifted children. *Creative Child and Adult Quarterly*, 11(4), 212-218.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78. DOI: 10.1037/0003-066X.55.1.68
- Ryan, R. M., & Deci, E. L. (2006). Self-regulation and the problem of human autonomy: Does psychology need choice, self-determination, and will? *Journal of Personality*, 74(6), 1557-1586. DOI: 10.1111/j.1467-6494.2006.00420.x
- Ryan, R. M., Koestner, R., & Deci, E. L. (1991). Ego-involved persistence: When free-choice behavior is not intrinsically motivated. *Motivation and Emotion*, 15(3), 185-205.
- Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, 8(2), 23-74.
- Schwarzer, R., Bähler, J., Kwiatek, P., Schröder, K., & Zhand, J. X. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-Efficacy Scale. *Applied Psychology: An International Review*, 46(1), 69-88.

- Silvia, P. J. (2008). Another look at creativity and intelligence: Exploring higher order models and probable confounds. *Personality and Individual Differences*, 44(4), 1012-1021. DOI: 10.1016/j.paid.2007.10.027
- Sligh, A. C., Conners, F. A., & Roskos-Ewoldsen, B. (2005). Relation of creativity to fluid and crystallized intelligence. *Journal of Creative Behavior*, 39(2), 123-136. DOI: 10.1002/j.2162-6057.2005.tb01254.x
- Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 3-15). Cambridge: Cambridge University Press.
- Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *Academy of Management Journal*, 45(6), 1137-1148.
- Tierney, P., & Farmer, S. M. (2004). The Pygmalion process and employee creativity. *Journal of Management*, 30(3), 413-432. DOI: 10.1016/j.jm.2002.12.001
- Tierney, P., Farmer, S. M., & Graen, G. B. (1999). An examination of leadership and employee creativity: The relevance of traits and relationships. *Personnel Psychology*, 52(3), 591-620. DOI: 10.1111/j.1744-6570.1999.tb00173.x
- Torrance, E. P. (1962). *Guiding creative talent*. Englewood Cliffs, NJ: Prentice-Hall.
- Vincent, A. S., Decker, B. P., & Mumford, M. D. (2002). Divergent thinking, intelligence, and expertise: A test of alternative models. *Creativity Research Journal*, 14(2), 163-178. DOI: 10.1207/S15326934CRJ1402_4
- Wolfradt, U., & Pretz, J. E. (2001). Individual differences in creativity: Personality, story writing, and hobbies. *European Journal of Personality*, 15(4), 297-310. DOI: 10.1002/per.409
- Wuthrich, V., & Bates, T. C. (2001). Schizotypy and latent inhibition: Non-linear linkage between psychometric and cognitive markers. *Personality and Individual Differences*, 30(5), 783-798. DOI: 10.1016/S0191-8869(00)00071-4
- Zhiyan, T., & Singer, J. L. (1996). Daydreaming styles, emotionality, and the big five personality dimensions. *Imagination, Cognition, and Personality*, 16(4), 399-414. DOI: 10.2190/ATEH-96EV-EXYX-2ADB

(Article received: 01-06-2012; reviewed: 12-03-2013; accepted: 12-03-2013)